



Nature of Gene Action for Cane, Ccs Yields and Their Yield Components in Sugarcane (*Saccharum Officinarum* .L)

M Triveni, M Charumathi, P V Rama Kumar and A V Ramana

Department of Genetic and Plant Breeding, Agricultural College, Bapatla 522 101, Andhra Pradesh

ABSTRACT

The clones *viz.*, 2000A 56, 2000A 240, 2001A 63, 2004A 55 and 2005A 128 were identified as the best clones among early group. 98A 163, 2000A 225, 2004A 104, 2000A 241 and 2005A 108 were registered as the superior clones among the midlate group based on higher mean values for shoot population at 120 DAP, 240 DAP, NMC at harvest, cane length, cane diameter, single cane weight, sucrose per cent, CCS per cent, cane and CCS yields. Additive gene action for NMC at harvest, cane length, single cane weight, cane volume, cane yield and CCS yield, where as germination per cent, shoot population at 90 DAP and purity per cent were under the influence of non additive gene action. Stalk population at 180 DAP and 240 DAP, cane diameter, brix per cent, sucrose per cent CCS per cent and fibre per cent indicated the importance of both additive and non additive gene action in inheritance of characters. The differential pattern of gene action for the characters could be due to environmental variation.

Key words :Gene Action, Genetic Parameters, Sugarcane.

Knowledge on the magnitude of variability coupled with heritability in the breeding material gives an idea on the possibility of effective genetic improvement through selection. The information on the nature and the magnitude of variability and heritability present in the genetic material is of prime importance for the breeder to initiate any effective selection program. Estimation of GCV and PCV along with the heritability as well as genetic advance to improve any trait of sugarcane. The success of genetic advance under selection depends on genetic variability, heritability and selection intensity. Simple selection can be practiced if high heritability coupled with high genetic advance are recorded for a character. Thus, the nature of gene action and inheritance of characters is essential so as to adopt a suitable breeding methodology in crop improvement. The information available on the inheritance of characters is scanty in sugarcane. The present study was carried out in sugarcane to access the variability for yield components, cane and sugar yield and to study the genetic parameters in 22 sugarcane clones.

MATERIALS AND METHODS

The present investigation was carried out during 2013-2014 at Regional Agricultural Research

Station, Anakapalle. The experimental material consists of 11 early and 11 midlate clones along with two standards Co 6907 (early) and Co 7219 (midlate) grown in RBD in three replications. All the recommended package of practices were followed to raise a healthy crop. Data were recorded from the net plot for germination per cent at 35 DAP, shoot population / stalk population at 90,120,180 and 240 DAP, brix per cent, sucrose per cent, purity per cent, CCS per cent, cane length (cm), cane diameter (cm), single cane weight (kg), cane volume, NMC at harvest, cane yield (t/ha), CCS yield (t/ha), fibre per cent and estimation of genetic diversity using RAPD markers in 22 sugarcane genotypes. Variance is an important population parameter, especially for studies in quantitative genetics (Sprague, 1966). In studies on components in sugarcane hybrid populations, George (1959) reported that populations with high means have the greater chance of showing maximum variability. Information on variability of important characters at different stages of selection improves understanding of the selection process, promotes the design of efficient selection systems and increases the efficiency of selection of individual varieties (Ahmed and Obeid, 2012). Hanson *et al.* (1956) defined heritability in broad sense as the ratio of genotypic variance to the total phenotypic

variance in the non-segregating populations. Low genetic advance irrespective of high or low heritability leads to non-additive gene action (Panse, 1957) and improvement of that trait by simple selection may not be rewarding (Verma *et al.*, 1987).

RESULTS AND DISCUSSION

Data on mean, PCV and GCV, heritability and GAM for yield components, cane and sugar yield are presented in the table.

The mean values for germination per cent(70.41), shoot population at 90 DAP(132.79), stalk population at 120 DAP(150.91), 180 DAP (168.41) and 240 DAP (144.76), NMC at harvest(122.18), brix per cent(21.22), sucrose per cent(19.19), purity per cent(90.42), CCS per cent(13.77), cane length(276.30), cane diameter(2.68), single cane weight(1.15), cane volume(194.91), cane yield (132.18), CCS yield(18.26) and fibre per cent(15.61) are recorded.

Low to moderate estimates of GCV and PCV along with low to moderate estimates of heritability and GAM for germination per cent (3.39, 6.95, 24.01 and 3.40), shoot population at 90 DAP (6.68, 10.66, 39.03 and 8.62), stalk population at 120 DAP (5.69, 8.70, 43.01 and 7.65) and purity

per cent(0.50, 0.84, 35.95 and 0.62) indicated the operation of non additive gene action in the inheritance of characters. Similar results were also reported by Singh *et al.*(2002), Singh *et al.*(2006), Sabitha (2007) and Sirisha(2009).

Moderate GCV and PCV coupled with moderate to high heritability and GAM for NMC (10.34, 10.37, 41.71 and 10.05), cane length (10.05, 10.37, 89.0 and 17.22), single cane weight(10.18, 10.85, 87.12 and 17.63), cane volume(29.29, 33.81, 75.11 and 52.26), cane yield(10.34 and 14.37, 42.0 and 12.50) and CCS yield(12.02, 16.80, 51.98 and 17.71) indicated the importance of additive gene action in governance of the characters. Simple selection procedures may help in bringing genetic improvement in these characters. The results were in agreement with the findings of Sabitha (2007), Rahman *et al.* (2008), Rahman and Bhuiyan (2009), Navneet Kumar *et al.* (2010), Charumathi *et al.*(2012), Ahmed and Obeid (2012), Nagaraja *et al.*(2014) and Priyanka *et al.*(2014).

Low to moderate values of GCV and PCV along with moderate to high estimates of heritability and GAM for stalk population at 180 DAP(6.62, 10.08, 43.03 and 8.95), 240 DAP(7.54, 11.70, 42.08 and 10.01), cane diameter(8.06, 9.11, 78.21 and 14.71), brix per cent(4.71, 5.05, 87.19 and 10.03), sucrose per cent(5.08, 5.45, 87.14 and 10.07), CCS

Table. Mean, variability, heritability, genetic advance and genetic advance as percent of mean for cane yield, yield components and juice quality parameters in sugarcane (*Saccharum officinarum* L.).

S.No	Character(s)	Mean	Range		GCV (%)	PCV (%)	Heritability (h ²)	Genetic Advance over mean
			Min.	Max.				
1.	Germination per cent at 35 DAP	70.41	64.00	78.00	3.39	6.95	24.01	3.40
2.	Shoot population at 90 DAP	132.79	118.00	152.00	6.68	10.66	39.03	8.62
3.	Stalk population at 120 DAP	150.91	130.00	168.00	5.69	8.70	43.01	7.65
4.	Stalk population at 180 DAP	168.41	142.00	196.00	6.62	10.08	43.03	8.95
5.	Stalk population at 240 DAP	144.76	123.00	175.33	7.54	11.70	42.08	10.01
6.	NMC at harvest	122.18	110.00	143.00	10.34	10.37	41.71	10.05
7.	Brix per cent	21.22	19.37	23.13	4.71	5.05	87.19	10.03
8.	Sucrose per cent	19.19	17.37	21.15	5.08	5.45	87.14	10.07
9.	Purity per cent	90.42	89.00	91.42	0.50	0.84	35.95	0.62
10.	CCS per cent	13.77	12.38	15.27	5.25	5.75	83.49	10.07
11.	Cane length (cm)	276.30	239.33	343.67	10.05	10.37	89.00	17.22
12.	Cane diameter (cm)	2.68	2.24	3.28	8.06	9.11	78.21	14.71
13.	Single cane weight (kg)	1.15	1.01	1.31	10.18	10.85	87.12	17.63
14.	Cane volume per plot	194.91	112.36	420.25	29.29	33.81	75.11	52.26
15.	Fibre per cent	15.61	14.00	20.00	8.45	8.59	97.00	17.11
16.	Cane yield (t/ha)	132.18	108.00	160.00	10.34	14.37	42.00	12.50
17.	CCS yield (t/ha)	18.26	14.65	23.74	12.02	16.80	51.98	17.71

per cent(5.25, 5.75, 83.49 and 10.07) and fibre per cent(8.45, 8.59, 97.0 and 17.11) indicated the importance of both additive and non additive gene action in the inheritance of the above characters. These results were in conformity with the findings of Sabitha (2007), Rahman *et al.* (2008), Rahman and Bhuiyan (2009), Sirisha (2009), Navneet Kumar *et al.* (2010), Anbanandan and Sarvanan (2010), Charumathi *et al.*(2012) and Ahmed and Obeid (2012) The differential pattern of gene action for the characters in the genotype could be due to environmental variation.

CONCLUSIONS

Based on the mean values, PCV and GCV, heritability and GAM it is concluded that germination per cent, shoot population at 90 DAP, stalk population at 120 DAP and purity per cent indicated the operation of non additive gene action in the inheritance of characters where as NMC, cane length, single cane weight, cane volume, cane yield and CCS yield indicated the importance of additive gene action in governance of the characters and stalk population at 180 DAP, 240 DAP, cane diameter, brix per cent, sucrose per cent, CCS per cent and fibre per cent indicated the importance of both additive and non additive gene action in the inheritance of the characters.

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